

CLAIMS

1. A double-row ball bearing with a preload application structure comprising:

an axle;

a sleeve surrounding said axle;

at least two rows of bearing balls disposed between said axle and said sleeve;

an inner bearing ring slidably mounted on said axle such that at least one of said rows of bearing balls is set between said inner bearing ring and said sleeve;

a resilient member connected to an external side surface of said inner bearing ring; and

a preload applying member connected to said resilient member;

wherein said preload applying member applies a preload to said inner bearing ring by applying pressure on said resilient member, and wherein, when an appropriate preload is applied to said inner ring, said preload applying member is fixed to said axle.

2. The double-row ball bearing according to Claim 1 wherein said axle further comprises a small diameter axle portion and a large diameter axle portion, and wherein said inner bearing ring, said resilient member and said preload applying member are disposed on said small diameter axle portion.

3. The double-row ball bearing according to Claim 2, wherein said axle further comprises a ball race formed directly on an outer surface of said large diameter axle part, wherein said sleeve further comprises a first ball race formed directly on an inner surface of said sleeve, and wherein a first row of bearing balls is set between said ball race of said axle and said first ball race of said sleeve.

4. The double-row ball bearing according to Claim 2, wherein said inner bearing ring further comprises a ball race formed on its outer surface, wherein said sleeve further comprises a second ball race formed directly on an inner surface of said sleeve, and wherein a second row of bearing balls is set between said ball race of said inner bearing ring and said second ball race of said sleeve.

5. The double-row ball bearing according to Claim 2, wherein said sleeve further comprises a larger inner diameter portion and a smaller inner diameter portion; wherein said double-row ball bearing further comprises an outer bearing ring, said outer bearing ring being mounted inside said larger inner diameter portion of said sleeve in an opposing relationship with said inner bearing ring; wherein a first row of said bearing balls is set between a ball race of said large diameter portion of said axle and a ball race of said smaller inner diameter portion of said sleeve; and wherein a second row of bearing balls is set between a ball race of said inner bearing ring and a ball race of said outer bearing ring.

6. The double-row ball bearing according to Claim 1 further comprising an outer bearing ring, wherein said axle further comprises a ball race formed directly on its outer surface, wherein said outer bearing ring further comprises a ball race

formed on its inner surface and wherein a first row of bearing balls is set between said ball race of said axle and said ball race of said outer bearing ring.

7. The double-row ball bearing according to Claim 6, wherein said inner bearing ring further comprises a ball race formed on its outer surface, wherein said sleeve further comprises a ball race formed directly on an inner surface of said sleeve, and wherein a second row of bearing balls is set between said ball race of said inner bearing ring and said ball race of said sleeve.

8. The double-row ball bearing according to Claim 1, wherein said resilient member is a coil spring.

9. The double-row ball bearing according to Claim 1, wherein said resilient member is an undulating spring.

10. The double-row ball bearing according to Claim 1, wherein said resilient member is a rigid spring.

11. The double-row ball bearing according to Claim 1, wherein said resilient member is made of an elastic material.

12. The double-row ball bearing according to Claim 1, wherein said preload applying member is a ring configured to apply pressure on said resilient member.

13. The double-row ball bearing according to Claim 1, wherein said preload applying member is a nut configured to apply pressure on said resilient member.

14. The double-row ball bearing according to Claim 1, wherein said preload applying member is a snap ring configured to apply pressure on said resilient member.

15. A double-row ball bearing with a preload application structure comprising:

an axle;

a sleeve surrounding said axle;

at least two rows of bearing balls disposed between said axle and said sleeve;

an outer bearing ring slidably mounted inside said sleeve such that at least one of said rows of bearing balls is set between said outer bearing ring and said axle;

a resilient member connected to an external side surface of said outer bearing ring; and

a preload applying member connected to said resilient member;

wherein said preload applying member applies a preload to said outer bearing ring by applying pressure on said resilient member, and wherein, when an appropriate preload is applied to said outer bearing ring, said preload applying member is fixed to said sleeve.

16. The double-row ball bearing according to Claim 15, wherein said sleeve further comprises a smaller inner diameter portion and a larger inner diameter portion, and wherein said outer bearing ring, said resilient member and said

preload applying member are disposed inside said larger inner diameter portion of said sleeve.

17. The double-row ball bearing according to Claim 15, wherein said sleeve further comprises a ball race formed directly on an inner surface of said sleeve, wherein said axle further comprises a first ball race formed directly on an outer surface of said axle, and wherein a first row of bearing balls is set between said first ball race of said axle and said ball race of said sleeve.

18. The double-row ball bearing according to Claim 15, wherein said outer bearing ring further comprises a ball race formed on its inner surface, wherein said axle further comprises a second ball race formed directly on an outer surface of said axle, and wherein a second row of bearing balls is set between said ball race of said outer bearing ring and said second ball race of said axle.

19. The double-row ball bearing according to Claim 18 further comprising a second outer bearing ring, said second outer bearing ring having a ball race formed on its inner surface; wherein said axle further comprises a first ball race formed directly on its outer surface; and wherein a first row of said bearing balls is set between said ball race of said second outer bearing ring and said first ball race of said axle.

20. The double-row ball bearing according to Claim 15 further comprising an inner ring mounted on said axle, said inner ring having a ball race formed on its outer surface; wherein said outer bearing ring further comprises a ball race formed on its inner surface; wherein said axle further comprises a ball race formed directly

on its outer surface; wherein said sleeve further comprises a ball race formed on its inner surface; and wherein a first row of bearing balls is set between said ball races of said outer bearing ring and said axle and a second row of bearing balls is set between said ball races of said inner bearing ring and said sleeve.

21. The double-row ball bearing according to Claim 16, wherein said axle further comprises a larger diameter portion and a smaller diameter portion; wherein said double-row ball bearing further comprises an inner bearing ring, said inner bearing ring being mounted on said smaller diameter portion of said axle in an opposing relationship with said outer bearing ring; wherein a first row of said bearing balls is set between a ball race of said larger diameter portion of said axle and a ball race of said smaller inner diameter portion of said sleeve; and wherein a second row of bearing balls is set between a ball race of said inner bearing ring and a ball race of said outer bearing ring.

22. The double-row ball bearing according to Claim 15, wherein said resilient member is a coil spring.

23. The double-row ball bearing according to Claim 15, wherein said resilient member is an undulating spring.

24. The double-row ball bearing according to Claim 15, wherein said resilient member is a rigid spring.

25. The double-row ball bearing according to Claim 15, wherein said resilient member is made of an elastic material.

26. The double-row ball bearing according to Claim 15, wherein said preload applying member is a ring configured to apply pressure on said resilient member.

27. The double-row ball bearing according to Claim 15, wherein said preload applying member is a nut configured to apply pressure on said resilient member.

28. The double-row ball bearing according to Claim 15, wherein said preload applying member is a snap ring configured to apply pressure on said resilient member.

29. A double-row ball bearing with a preload application structure comprising:

an axle;

a sleeve surrounding said axle;

at least two rows of bearing balls disposed between said axle and said sleeve;

an inner bearing ring slidably mounted on said axle such that at least one of said rows of bearing balls is set between said inner bearing ring and said sleeve; and

a preload applying member connected to an external side surface of said inner bearing ring;

wherein said preload applying member applies a preload by applying pressure to said inner bearing ring, and wherein, when an appropriate preload is applied to said inner bearing ring, said preload applying member is fixed to said axle.

30. The double-row ball bearing according to Claim 29, wherein said preload applying member is a nut configured to apply pressure to said inner bearing ring.

31.A double-row ball bearing with a preload application structure comprising:

an axle;

a sleeve surrounding said axle;

at least two rows of bearing balls disposed between said axle and said sleeve;

an outer bearing ring slidably mounted inside said sleeve such that at least one of said rows of bearing balls is set between said outer bearing ring and said axle; and

a preload applying member connected to an external side surface of said outer bearing ring;

wherein said preload applying member applies a preload by applying pressure to said outer bearing ring, and wherein, when an appropriate preload is applied to said outer bearing ring, said preload applying member is fixed to said sleeve.

32. The double-row ball bearing according to Claim 31, wherein said preload applying member is a nut configured to apply pressure to said outer bearing ring.

33. A method of preloading a double-row ball bearing comprising the steps of:

connecting a slidably mounted inner bearing ring of said double-row bearing to a preloading mechanism;

applying pressure to said preloading mechanism;

fixing a component of said preloading mechanism to an axle of said double-row bearing when an appropriate preload is achieved.

34. A method of preloading a double-row ball bearing comprising the steps of:

connecting a slidably mounted outer bearing ring of said double-row bearing to a preloading mechanism;

applying pressure to said preloading mechanism;

fixing a component of said preloading mechanism to a sleeve of said double-row bearing when an appropriate preload is achieved.